

CLAIMS

1. A high-voltage discharge lamp lighting apparatus comprising:

lighting means comprising a stabilizer and an ignitor circuit comprising an oscillating circuit-for-driving and a high-voltage pulse generating transformer, the stabilizer for supplying a power voltage necessary for maintaining the lighting operation to a high-voltage discharge lamp, the oscillating circuit-for-driving for generating a start pulse upon starting the lighting operation of the high-voltage discharge lamp, the high-voltage pulse generating transformer for increasing a voltage of the start pulse;

cap means which attaches and holds the high-voltage discharge lamp, including a part of the high-voltage pulse generating transformer of the ignitor circuit; and

socket means to which the cap means is fit and attached and which includes at least the oscillating circuit-for-driving in the ignitor circuit and a part of the high-voltage pulse generating transformer other than the included part of the cap means.

2. The high-voltage discharge lamp lighting apparatus according to Claim 1, wherein the high-voltage pulse generating transformer included in the cap means comprises a magnetic core and a secondary coil forming the high-voltage

pulse generating transformer, the socket means includes a primary coil of the high-voltage pulse generating transformer, and, the operation for fitting and attaching the cap means to the socket means causes to function as the high-voltage pulse generating transformer.

3. The high-voltage discharge lamp lighting apparatus according to Claim 1, wherein the high-voltage pulse generating transformer included in the cap means comprises a secondary coil forming the high-voltage pulse generating transformer, the socket means includes a primary coil and a magnetic core of the high-voltage pulse generating transformer, and the operation for fitting and attaching the cap means to the socket means causes to function as the high-voltage pulse generating transformer.

4. The high-voltage discharge lamp lighting apparatus according to Claim 1, wherein the high-voltage pulse generating transformer included in the cap means comprises a part of a primary coil forming the high-voltage pulse generating transformer, the socket means includes a primary coil, a magnetic core, and a secondary coil of the high-voltage pulse generating transformer, and the operation for fitting and attaching the cap means to the socket means causes to form the primary coil of the high-voltage pulse generating transformer and further causes to function as the high-voltage pulse generating transformer.

5. The high-voltage discharge lamp lighting apparatus according to Claim 1, wherein the high-voltage pulse generating transformer included in the cap means comprises a magnetic core forming the high-voltage pulse generating transformer, the socket means includes a primary coil and a secondary coil of the high-voltage pulse generating transformer, and the operation for fitting and attaching the cap means to the socket means causes to function as the high-voltage pulse generating transformer.

6. The high-voltage discharge lamp lighting apparatus according to Claim 2, wherein the socket means has a fitting and attaching portion which is formed into a cylindrical member, and two connecting pieces connected to two output terminals of the stabilizer are apart from each other in the axial direction and are arranged at different angles in the circumferential direction on the inner-circumferential side surface of the cylindrical member, and

the cap means has a fitting and attaching portion which is formed into a cylindrical member and which can be fit into the inner circumference of the cylindrical member of the socket means, first and second contacts contact with the two connecting pieces are apart from each other in the axial direction with a ring shape on the outer-circumferential side surface of the cylindrical member of the cap means, the first contact is connected to one electrode of the high-

voltage discharge lamp, and the second contact is connected to one end portion via the secondary coil of the high-voltage pulse generating transformer from another electrode of the high-voltage discharge lamp.

7. The high-voltage discharge lamp lighting apparatus according to Claim 3, wherein the socket means has a fitting and attaching portion which is formed into a cylindrical member, and two connecting pieces connected to two output terminals of the stabilizer are apart from each other in the axial direction and are arranged at different angles in the circumferential direction on the inner-circumferential side surface of the cylindrical member, and

the cap means has a fitting and attaching portion which is formed into a cylindrical member and which can be fit into the inner circumference of the cylindrical member of the socket means, first and second contacts contact with the two connecting pieces are apart from each other in the axial direction with a ring shape on the outer-circumferential side surface of the cylindrical member of the cap means, the first contact is connected to one electrode of the high-voltage discharge lamp, and the second contact is connected to one end portion via the secondary coil of the high-voltage pulse generating transformer from another electrode of the high-voltage discharge lamp.

8. The high-voltage discharge lamp lighting apparatus according to Claim 4, wherein the socket means has a fitting and attaching portion which is formed into a cylindrical member, two connecting pieces connected to one output terminal of the stabilizer and a terminated end of the primary coil of the high-voltage pulse generating transformer are apart from each other in the axial direction and are arranged at different angles in the circumferential direction, and an inner-circumferential bottom surface of the cylindrical member of the socket means has a connecting piece on the high-voltage side which is connected to a terminated end from another output terminal of the stabilizer via the secondary coil of the high-voltage pulse generating transformer, and

the cap means has a fitting and attaching portion which is formed into a cylindrical member fittable into the inner circumference of the cylindrical member of the socket means, the outer-circumferential side surface of the cylindrical member of the cap means has a first contact with a ring shape with which the two connecting pieces can make contact, the outer-circumferential bottom surface of the cylindrical member of the cap means has a contact on the high-voltage side with a projected shape which makes contact with the connecting piece on the high-voltage side, and the first contact and the contact on the high-voltage side are

connected to electrodes on both terminals of the high-voltage discharge lamp.

9. The high-voltage discharge lamp lighting apparatus according to Claim 5, wherein the socket means has a fitting and attaching portion which is formed into a cylindrical member, the inner-circumferential side surface of the cylindrical member has a first connecting piece connected to one output terminal of the stabilizer, the inner-circumferential bottom surface of the cylindrical member has a connecting piece on the high-voltage side connected to a terminated end from another output terminal of the stabilizer via the secondary coil of the high-voltage pulse generating transformer, and

the cap means has a fitting and attaching portion which is formed into a cylindrical member fittable into the inner circumference of the cylindrical member of the socket means, the outer-circumferential side surface of the cylindrical member of the cap means has a first contact with a ring shape with which the first connecting piece makes contact, the outer-circumferential bottom surface of the cylindrical member of the cap means has a contact on the high-voltage side which is in contact with the connecting piece on the high-voltage side, and the first contact and the contact on the high-voltage side are connected to electrodes on both terminals of the high-voltage discharge lamp.

10. A high-voltage discharge lamp lighting apparatus according to Claim 4, wherein the high-voltage pulse generating transformer comprises:

a magnetic core comprising a first magnetic core member having a pair of leg portions with a U-shaped cross-section, and a second magnetic core member having one end which comes into contact with one leg portion of the first magnetic core member and another end which has a gap to the other leg portion of the first magnetic core member with an I-shape of the one end and the other end of the first magnetic core member opposed to each other;

a secondary coil wound to the second magnetic core member;

a primary coil which is wound to the secondary magnetic core member coaxially from the top of the secondary coil and apart therefrom; and

A molding member for insulation covering which encloses the primary coil, the secondary coil, and the second magnetic core member except for its one end and which fills the gap formed between the first magnetic core member and the second magnetic core member.

11. A high-voltage discharge lamp lighting apparatus according to Claim 8, wherein the high-voltage pulse generating transformer comprises:

a magnetic core comprising a first magnetic core member

having a pair of leg portions with a U-shaped cross-section, and a second magnetic core member having one end which comes into contact with one leg portion of the first magnetic core member and another end which has a gap to the other leg portion of the first magnetic core member with an I-shape of the one end and the other end of the first magnetic core member opposed to each other;

a secondary coil wound to the second magnetic core member;

a primary coil which is wound to the secondary magnetic core member coaxially from the top of the secondary coil and apart therefrom; and

A molding member for insulation covering which encloses the primary coil, the secondary coil, and the second magnetic core member except for its one end and which fills the gap formed between the first magnetic core member and the second magnetic core member.

12. A high-voltage discharge lamp apparatus comprising:  
a high-voltage discharge lamp lighting apparatus according to Claim 1; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

13. A high-voltage discharge lamp apparatus comprising:  
a high-voltage discharge lamp lighting apparatus

according to Claim 2; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

14. A high-voltage discharge lamp apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 3; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

15. A high-voltage discharge lamp apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 4; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

16. A high-voltage discharge lamp apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 5; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

17. A high-voltage discharge lamp apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 6; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

18. A high-voltage discharge lamp apparatus comprising:  
a high-voltage discharge lamp lighting apparatus according to Claim 7; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

19. A high-voltage discharge lamp apparatus comprising:  
a high-voltage discharge lamp lighting apparatus according to Claim 8; and  
a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

20. A high-voltage discharge lamp apparatus comprising:  
a high-voltage discharge lamp lighting apparatus according to Claim 9; and  
a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

21. A high-voltage discharge lamp apparatus comprising:  
a high-voltage discharge lamp lighting apparatus according to Claim 10; and  
a high-voltage discharge lamp which is controlled for

the lighting operation by the high-voltage discharge lamp lighting apparatus.

22. A high-voltage discharge lamp apparatus comprising:  
a high-voltage discharge lamp lighting apparatus  
according to Claim 11; and  
a high-voltage discharge lamp which is controlled for  
the lighting operation by the high-voltage discharge lamp  
lighting apparatus.

23. A floodlight projector apparatus comprising:  
a high-voltage discharge lamp lighting apparatus  
according to Claim 1; and  
a high-voltage discharge lamp which is controlled for  
the lighting operation by the high-voltage discharge lamp  
lighting apparatus.

24. A floodlight projector apparatus comprising:  
a high-voltage discharge lamp lighting apparatus  
according to Claim 2; and  
a high-voltage discharge lamp which is controlled for  
the lighting operation by the high-voltage discharge lamp  
lighting apparatus.

25. A floodlight projector apparatus comprising:  
a high-voltage discharge lamp lighting apparatus  
according to Claim 3; and  
a high-voltage discharge lamp which is controlled for  
the lighting operation by the high-voltage discharge lamp

lighting apparatus.

26. A floodlight projector apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 4; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

27. A floodlight projector apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 5; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

28. A floodlight projector apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 6; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

29. A floodlight projector apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 7; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

30. A floodlight projector apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 8; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

31. A floodlight projector apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 9; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

32. A floodlight projector apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 10; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.

33. A floodlight projector apparatus comprising:

a high-voltage discharge lamp lighting apparatus according to Claim 11; and

a high-voltage discharge lamp which is controlled for the lighting operation by the high-voltage discharge lamp lighting apparatus.